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Original Contributions

EMERGENCY DEPARTMENT CARDIOPULMONARY EVALUATION OF LOW-RISK CHEST PAIN PATIENTS WITH SELF-REPORTED STRESS AND ANXIETY

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☐ **Abstract—Background: Chest pain is a high-risk emergency department (ED) chief complaint; the majority of clinical resources are directed toward detecting and treating cardiopulmonary emergencies. However, at follow-up, 80%–95% of these patients have only a symptom-based diagnosis; a large number have undiagnosed anxiety disorders. Objective: Our aim was to measure the frequency of self-identified stress or anxiety among chest pain patients, and compare their pretest probabilities, care processes, and outcomes. Methods: Patients were divided into two groups: explicitly self-reported anxiety and stress or not at 90-day follow-up, then compared on several variables: ultralow (<2.5%) pretest probability, outcome rates for acute coronary syndrome (ACS) and pulmonary embolism (PE), radiation exposure, total costs at 30 days, and 90-day recidivism. Results: Eight hundred and forty-five patients were studied. Sixty-seven (8%) explicitly attributed their chest pain to "stress" or "anxiety"; their mean ACS pretest probability was 4% (95% confidence interval 2.9%–5.7%) and 49% (33/67) had ultralow pretest probability (0/33 with ACS or PE). None (0/67) were diagnosed with anxiety. Seven hundred and seventy-eight did not report stress or anxiety and, of these, 52% (403/778) had ultralow ACS pretest probability. Only one patient (0.2%; 1/403) was diagnosed with ACS and one patient (0.4%; 1/268) was diagnosed with PE. Patients with self-reported anxiety had similar radiation exposure, associated costs, and nearly identical (25.4% vs. 25.7%) ED recidivism to patients without reported anxiety. Conclusions: Without prompting, 8% of patients self-identified "stress" or "anxiety" as the etiology for their chest pain. Most had low pretest probability, were over-investigated for ACS and PE, and not investigated for anxiety syndromes.** © 2016 Elsevier Inc. All rights reserved.

☐ **Keywords—acute coronary syndrome; pulmonary embolism; psychological conditions**

INTRODUCTION

Patients who present with chest pain account for approximately 7 million visits to United States (US) emergency departments (EDs) (1). Emergency medicine providers view chest pain as a high-risk complaint, as acute coronary syndrome (ACS) and pulmonary embolism (PE) are two entities included in the differential that are imminent threats to life. Thus, most resources and clinical efforts are focused on the detection and treatment ACS and PE. However, between 80% and 95% of all patients presenting to EDs with complaints of chest pain do not have cardiac disease, or any other cardiopulmonary emergency by conventional testing (2–6). Further, previous findings indicate that up to 55% of patients with

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non-cardiopulmonary chest pain may be suffering from anxiety or panic disorders, and these psychiatric disorders remain undiagnosed in almost 90% of cases (7–13). Costs associated with the evaluation of chest pain found not to be related to an emergent cardiopulmonary condition have been estimated to be between $315 million and $8 billion per year, usually with no definitive cause contributing to recurrent ED visits (14,15).

We sought to measure the frequency of self-identified stress or anxiety among a large prospectively collected cohort of patients presenting to the ED with chest pain and compare their pretest probabilities, care processes, and outcomes.

METHODS

Study Design

This is an unplanned secondary analysis of a prospective outcomes study from 4 centers including 851 participants presenting to the ED with chest pain and shortness of breath. This analysis relies on the methods, inclusion/exclusion criteria, and data collection utilized in the original outcomes study, which have been previously published but will be summarized here (2).

Setting

The four centers from which data were collected included 3 academic hospitals (Carolinas Medical Center Main Hospital, Charlotte, NC; University of Mississippi Medical Center, Jackson, MS; and Beth Israel Deaconess Medical Center, Boston, MA) and 1 community hospital (Forsyth Hospital, Winston Salem, NC). The data collection for this study took place between January 2010 and February 2013 and the ClinicalTrials.gov identifier is NCT01059500. The US Food and Drug Administration investigational device exemption number is IDE#125834. All sites obtained respective Institutional Review Board approval.

Participants

Potential patients were identified at the participating hospitals by research assistants viewing the electronic tracking board in the ED for the chief complaint of "chest pain" under a partial waiver of consent for screening. Patients eligible for enrollment included adults (≥17 years of age) presenting with chest pain or discomfort in addition to dyspnea. English-speaking patients were eligible, as were Spanish-speaking patients with aid of a language interpreter. Additionally, all patients had to have a 12-lead electrocardiogram (ECG) ordered by the treating physician. Patients were excluded for the presence of any of the following: an ECG computer interpretation of ischemia or infarction, acute myocardial infarction, or ST-elevation myocardial infarction; known diagnosis of acute PE within the previous 24 h; recent or current myocardial infarction; recent coronary artery bypass grafting (within 30 days); other "obvious conditions or diagnosis identified by the emergency physician as mandating admission (evidence of circulatory shock, severe hypoxemia, decompensated heart failure, altered mental status, hemorrhage, sepsis syndrome, arrhythmia, trauma, unstable social or psychiatric situation, stroke, aortic disaster, or pneumonia)"; cocaine use within 72 h; physician referral to ED specifically for admission; patients requiring medical clearance secondary to a court order or for referral to a detoxification center; individuals visiting from out of town or with other situations thought to be a hindrance to follow-up, such as homelessness; individuals from jail or in police custody; and pregnant patients (2). Individuals who left against medical advice, were subsequently incarcerated within 14 days of their visit, or who were objectively cocaine positive by testing were subject to post-enrollment exclusion (2).

The method of attribute matching was used to estimate each patient's pretest probability for both ACS and PE using clinical predictors (6,16). Attribute matching uses computer software to match clinical predictors entered by practitioners for ACS and PE (8 and 10, respectively). This profile is entered into a web-based computer program linked to two large databases of patients with chest pain and dyspnea (http://pretestconsult.com/v21/acs and http://pretestconsult.com/v21/pe). Those with exact profile matches were extracted, providing both the denominator of all matches as well as the number of those with either ACS or PE (numerator), which in turn produced a numeric pretest probability value. These values could be further be divided into four subgroups (ultralow, 0 to < 2.5%; low, 2.5%–5.5%; moderate, >5.5%–10%; and high, >10%) (2,17). These patients were followed for outcomes out to 90 days using structured medical record chart review, as well as validated questionnaires administered by phone (2,18).

In addition to the administered validated questionnaires, all patients were asked "What do you believe caused your chest pain?" at the end of the telephone follow-up at 90 days. No further prompting was given and the patients were allowed to answer freely, and answers were recorded in the patient's own words.

Variables

To test the main study question, patients were divided into 2 groups: those who explicitly self-reported anxiety or stress and those who did not (groups 1 and 2, respectively). We then compared ultralow pretest probabilities

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for both ACS and PE, as well as the frequency of ACS and PE diagnoses in this subgroup, total radiation exposure to the chest (mSv), total costs at 30 days, and finally 90-day returns to the ED, as well as observation and inpatient admissions.

Radiation and Cost Data

Radiation doses were estimated from chest radiography, cardiac and ventilation-perfusion scanning, computed tomography scanning, and fluoroscopy-guided studies (eg, cardiac catheterization, upper gastrointestinal series) (2,19,20). Medical cost data were collected from the universal hospital claims submission form (UB-92 CMS-1450) with charges converted to cost using the cost-to-charge ratio method, which relies on the Medicare impact file to correct for markup (21). This method excludes professional billing.

Statistical Methods

IBM SPSS software, version 23 (released 2013, IBM Corp, Armonk, NY) was used for descriptive statistics and analysis comparing means, medians, frequencies, and proportions. The 95% confidence intervals for these comparisons, including those of proportions, are reported for illustration of effect size instead of *p* values. Any missing case variables were excluded from their respective analysis and noted in the tables.

RESULTS

From December 2010 to February 2013, eight hundred and fifty-one patients were enrolled. Six patients were excluded from analysis because they either signed out against medical advice or left before evaluation completion, leaving 845 for analysis. Patient characteristics, exposures, bias mitigation, and potential confounders for this population have been reported previously (2). Basic demographic data is retabulated in Table 1 for comparison according to the specified groups described in the Methods section. When asked "What do you think caused your chest pain?" Sixty-seven (8%; 95% confidence interval [CI] 7.7%–8.3%) patients responded explicitly that they believed their chest pain was caused by mental "stress" or "anxiety." Examples of patient responses include: "It was probably a panic attack"; "I don't know, I've been under a lot of stress"; "Fear and anxiety." These patients comprise Group 1 (Table 1) and their mean ACS pretest probability was 4% (95% CI 2.9%–5.7%) with 49% (95% CI 37.4%–61.2%) (33/67) having an ultralow (<2.5%) ACS pretest probability, and none (0/67) had ACS as shown in Table 2. The mean PE pretest probability was 5% (95% CI 3.6%–5.7%) with 46% (95% CI 34.4%–58.2%) (31/67) of patients having an ultralow PE pretest probability and none (0/67) had PE. Additionally, none (0/67) of these patients who believed their chest pain was caused by mental stress or anxiety were actually diagnosed with anxiety in the ED. Almost all received a descriptive diagnosis, such as "chest pain."

Table 1. Group Assignment According Anxiety Self-Report and Demographics

Variable	Group 1: Stress or Anxiety (n = 67)	Group 2: No Stress or Anxiety (n = 778)	Totals (n = 845)*
Sex, n (%)			
Female	32 (6.7)	446 (93.3)	478 (56.6)
Male	35 (9.5)	332 (90.5)	367 (43.4)
Race, n (%)			
African American/black	35 (8.7)	388 (91.7)	423 (50.1)
White	26 (7.7)	313 (92.3)	339 (40.1)
American Indian	0 (0.0)	3 (100)	3 (0.4)
Asian	0 (0.0)	4 (100)	4 (0.5)
Other	3 (17.6)	14 (82.4)	17 (2.0)
Unknown	3 (5.1)	56 (94.9)	59 (5.1)
Ethnicity, n (%)			
Hispanic or Latino	7 (13.7)	44 (86.3)	51 (6.0)
Not Hispanic or Latino	60 (7.6)	734 (92.4)	794 (94)
Age, y, mean (95% CI)	45.8 (42.6–49.0)	49.1 (48.0–50.2)	—
Acute coronary syndrome pretest probability,† %, mean (95% CI)	4.3 (2.9–5.7)	4.3% (3.9–4.7)	—
Pulmonary embolism pretest probability,† %, mean (95% CI)	4.7 (3.6–5.7)	5.7 (5.3–6.1)	—
ICD-9 diagnosis of anxiety, n (%)	0 (0)	2 (100)	2 (0.2)

CI = confidence interval; ICD-9 = International Classification of Disease, 9th Revision.
* Six subjects excluded (left against medical advice or before evaluation).
† Derived from attribute matching using clinical predictors for acute coronary syndrome and pulmonary embolism. Numeric pretest probability values divided into 4 subgroups (0 to <2.5% ultralow, 2.5%–5.5% low, >5.5%–10% moderate, and >10% high).

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Table 2. Descriptive Outcome Variable Comparisons

Variable	Group 1: Stress/Anxiety (n = 67)		Group 2: No Stress/Anxiety (n = 778)	
	Median (IQR)	Mean or n (%) [95% CI]	Median (IQR)	Mean or n (%) [95% CI]
Ultralow (<2.5%) probability for ACS	—	33 (49.3) [37.4–61.2]	—	403 (51.8) [48.3–55.3]
Proportion diagnosed with ACS	—	0 (0)	—	1 (0.2) [0–0.6%]
Ultralow (<2.5%) probability for PE	—	31 (46.3) [34.4–58.2]	—	268 (34.4) [31.1–37.7]
Proportion diagnosed with PE	—	0 (0)	—	1 (0.4) [0–1.2]
Total radiation dose from chest imaging within 90 days, mSv*	0.06 (0.06–8.02)	3.06 [1.78–4.34]	0.12 (0.06–8.06)	5.03 [4.14–5.92]
Chest radiation >5 mSv*		18 (27.2) [16.5–37.9]		296 (38.6) [35.2–42]
Total medical cost within 30 days, $†‡	790 (560−2,144)	2,609 [1,592−3,626]	1,408 (631−3,119)	3,587 [2,954−4,221]
90-Day ED returns	—	17 (25.4) [15.0–35.8]	—	200 (25.7) [22.6–28.8]
90-Day observation admissions	—	0 (0.0)	—	13 (1.7) [1.0–2.6]
90-Day inpatient admissions	—	2 (2.9) [1.8–4.0]	—	81 (10.4) [8.3–12.5]

ACS = acute coronary syndrome; ED = emergency department; IQR = interquartile range; PE = pulmonary embolism.
* Subjects with missing radiation data (1 and 11 for groups 1 and 2, respectively).
† Does not include professional charges.
‡ Subjects with missing cost data (0 and 21 for groups 1 and 2, respectively).

Seven hundred and seventy-eight (92%) patients had no explicit mention of anxiety (Group 2) and their demographics are shown in Table 1. The mean ACS pretest probability for this group was 4% (95% CI 3.9%–4.7%) and of these, 51.8% (95% CI 48.3%–55.3%) (403/778) had an ultralow ACS pretest probability. Their mean PE pretest probability was 6% (5.3%–6.1%) with 268 (34.4%; 95% CI 31.1%–37.7%) having an ultralow pretest probability for PE. There was one patient (0.2%; 95% CI 0%–0.6%; 1/403) with an ultralow ACS probability diagnosed with ACS and one patient (0.4%; 95% CI 0%–1.2%; 1/268) with an ultralow PE probability diagnosed with PE. Only 2 of 778 (0.3%; 95% CI 0%–0.7%) patients who did not report anxiety received an International Classification of Diseases, 9th Revision (ICD-9), diagnosis of anxiety (22).

We compared the outcomes of total chest radiation exposure (mSv), cost at 30 days, as well as 90-day returns (ED, observation, and inpatient) between the two groups shown in Table 2. Patients who self-reported anxiety had costs estimated to be $2,609 (95% CI $1,592−$3,626) and mean total radiation exposure of 3.1 mSv (95% CI 1.8–4.3 mSv) with 18 (27.2%; 95% CI 16.5%–37.9%) having > 5 mSv radiation exposure. While those who did not explicitly endorse anxiety had costs of $3,587 (95% CI $2,954−$4,221) and mean radiation exposure of 5.0 mSv (95% CI 4.1–5.9 mSv) with 296 (38.6%; 95% CI 35.2%–42%) having > 5 mSv radiation exposure. With regard to 90-day returns, patients with self-reported anxiety had 17 (25.4%; 95% CI 15.0%–35.8%) ED returns, zero observation admissions, and 2 (3%; 95% CI 1.8%–4.0%) inpatient admissions. Those without anxiety report had a total of 200 (25.7%; 95% CI 22.6%–28.8%) ED returns, 13 (1.7%; 95% CI 1.0%–2.6%) observation admissions, and 81 (10.4%; 95% CI 8.3%–12.5%) inpatient admissions within 90 days.

DISCUSSION

We found that 67 of 845 (8%) patients volunteered anxiety as the cause of their chest pain evaluated 90 days previously. None of these patients had ACS or PE, and their radiation exposure, costs, and recidivism rates were similar to patients who did not volunteer anxiety. None of the 67 patients with self-perceived anxiety were treated for anxiety or given a diagnosis of anxiety. These findings suggest that usual ED care to exclude ACS and other cardiopulmonary emergencies may not always serve patients optimally. Usual care can require 6−48 h, multiple tests, radiation exposure, and high costs (23). Despite this, an overwhelmingly majority of these patients do not have ACS, PE, or other cardiopulmonary emergencies (2−6). This is especially important, as studies suggest that the majority of patients with noncardiac chest pain may develop chronic chest pain and continue to seek medical attention despite negative cardiac evaluations and reassurance (24,25). Further, a significant number of these patients with noncardiac chest pain may have underlying anxiety or panic, which are driving their symptoms (7–13).

A striking observation was that there were only 2 of 845 patients in the entire cohort who were given an ICD-9 diagnosis of anxiety or similar, and we believe that many more patients beyond the 67 with self-awareness probably had undiagnosed anxiety. That no patients who self-identified anxiety were diagnosed as such implies a missed opportunity for providers to have detected anxiety simply by asking the patient.

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Prior work has shown that a central feature of future *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition anxiety disorder diagnoses begins with reliable self-report (26–28). Our work adds to the work of Webster et al., who administered standardized psychometric and quality of life testing to chest pain patients both in the ED and at 1-month post-ED visit (29). The authors found that overall, chest pain patients scored higher than normative values would predict, and 17% had "moderately severe" anxiety scores. Further, higher baseline anxiety scores correlated with more frequent chest pain at 1-month follow-up (29). We believe the finding in our study of 8% of patients essentially "self-diagnosing" anxiety 90 days later is consistent with the findings by Webster et al. and others showing frequent psychological distress in patients with noncardiac chest pain (3,29,30). Detection and treatment of anxiety and panic syndromes may help forestall development of chronic chest pain, and recurrent desire for medical reassurance, despite negative cardiac evaluations.

Many clinicians believe that the medical community fosters a culture of persecution for diagnosing anxiety in a patient who has a true emergency. Our data also suggest the possible use of pretest probability to bolster the confidence of clinicians in raising the issue of anxiety. Almost half (49% and 46%) of patients with self-identified anxiety had an ultralow pretest probability for ACS and PE, respectively, and no patient with ultralow pretest probability and self-reported anxiety had a cardiopulmonary emergency. We note that, in fact, no patient with self-reported anxiety had a cardiopulmonary emergency. However, a substantial proportion of patients with anxiety received > 5.0 mSv radiation, with high cost of medical care.

We hypothesized that patients in our anxiety/stress cohort (Group 1) would have higher levels of recidivism than patients without self-identified anxiety or significant cardiopulmonary diagnoses (Group 2). We actually observed that there were no significant differences for 90-day returns to the ED for evaluation or for observation admissions within 90 days: approximately 25% in both groups. With regard to inpatient admissions, it does appear that Group 2 patients were more likely to have a hospital readmission within 90 days. This, however, is not surprising, given the fact that virtually every patient diagnosed with a cardiopulmonary emergency was in Group 2, which is to be expected, given that patients with these conditions would be less likely to volunteer anxiety as their main problem. These results highlight the fact that, despite the frequently low risk, these self-identified anxiety patients have essentially the same rate of return to the ED for re-evaluation.

Limitations

This was an unplanned secondary analysis of a prospectively collected dataset. Thus, while answers to the question about the reason for their chest pain were collected prospectively, patients were not specifically asked about stress or anxiety at either enrollment in the ED or follow-up. Thus, we have no data from the day of enrollment to determine whether patients perceived the presence of anxiety, which would likely have altered the proportions of patients assigned to each group. Additionally, those patients providing responses at the 90-day follow-up presumably had the benefit of knowing the outcome of their evaluation and may have even come to their conclusions about the cause of their chest pain because of their negative evaluation.

CONCLUSIONS

Anxiety was perceived as an obvious problem to 8% of patients 90 days after evaluation for dyspnea and chest pain. That none of these patients had a serious diagnosis, none were treated for anxiety, and one-quarter returned for medical care within 90 days implies a missed opportunity to detect a treatable condition in patients who seldom receive an actionable diagnosis.

REFERENCES

1. Centers for Disease Control and Prevention/National Center for Health Statistics National Hospital Ambulatory Medical Care Survey. National Hospital Ambulatory Medical Care Survey: 2011 Emergency Department Summary Tables. Atlanta, GA: Centers for Disease Control and Prevention; 2011.
2. Kline JA, Shapiro NI, Jones AE, et al. Outcomes and radiation exposure of emergency department patients with chest pain and shortness of breath and ultralow pretest probability: a multicenter study. Ann Emerg Med 2014;63:281–8.
3. Webster R, Norman P, Goodacre S, Thompson A. The prevalence and correlates of psychological outcomes in patients with acute non-cardiac chest pain: a systematic review. Emerg Med J 2012; 29:267–73.
4. Lenfant C. Chest pain of cardiac and noncardiac origin. Metab Clin Exp 2010;59(Suppl. 1):S41–6.
5. Eslick GD, Talley NJ. Natural history and predictors of outcome for non-cardiac chest pain: a prospective 4-year cohort study. Neurogastroenterol Motil 2008;20:989–97.
6. Mitchell AM, Garvey JL, Chandra A, Diercks D, Pollack CV, Kline JA. Prospective multicenter study of quantitative pretest probability assessment to exclude acute coronary syndrome for patients evaluated in emergency department chest pain units. Ann Emerg Med 2006;47:447.
7. Foldes-Busque G, Marchand A, Chauny J-M, et al. Unexplained chest pain in the ED: could it be panic? Am J Emerg Med 2011; 29:743–51.
8. Demiryoguran NS, Karcioglu O, Topacoglu H, et al. Anxiety disorder in patients with non-specific chest pain in the emergency setting. Emerg Med J 2006;23:99–102.

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9. Fleet RP, Lavoie KL, Martel JP, Dupuis G, Marchand A, Beitman BD. Two-year follow-up status of emergency department patients with chest pain: was it panic disorder? CJEM 2003;5: 247–54.
10. Eken C, Oktay C, Bacanli A, et al. Anxiety and depressive disorders in patients presenting with chest pain to the emergency department: a comparison between cardiac and non-cardiac origin. J Emerg Med 2010;39:144–50.
11. Fagring AJ, Kjellgren KI, Rosengren A, Lissner L, Manhem K, Welin C. Depression, anxiety, stress, social interaction and health-related quality of life in men and women with unexplained chest pain. BMC Public Health 2008;8:165.
12. Kuijpers PM, Denollet J, Lousberg R, Wellens HJ, Crijns H, Honig A. Validity of the hospital anxiety and depression scale for use with patients with noncardiac chest pain. Psychosomatics 2003;44:329–35.
13. Aikens JE, Michael E, Levin T, Myers TC, Lowry E, McCracken LM. Cardiac exposure history as a determinant of symptoms and emergency department utilization in noncardiac chest pain patients. J Behav Med 1999;22:605–17.
14. Leise MD, Locke GR 3rd, Dierkhising RA, Zinsmeister AR, Reeder GS, Talley NJ. Patients dismissed from the hospital with a diagnosis of noncardiac chest pain: cardiac outcomes and health care utilization. Mayo Clin Proc 2010;85:323–30.
15. Eslick GD, Coulshed DS, Talley NJ. Review article: the burden of illness of non-cardiac chest pain. Aliment Pharmacol Ther 2002; 16:1217–23.
16. Kline JA, Johnson CL, Pollack CV Jr, et al. Pretest probability assessment derived from attribute matching. BMC Med Inform Decis Making 2005;5:26.
17. Kline JA, Courtney DM, Than MP, et al. Accuracy of very low pretest probability estimates for pulmonary embolism using the method of attribute matching compared with the Wells score. Acad Emerg Med 2010;17:133–41.
18. Kline JA, Mitchell AM, Runyon MS, Jones AE, Webb WB. Electronic medical record review as a surrogate to telephone follow-up to establish outcome for diagnostic research studies in the emergency department. Acad Emerg Med 2005;12:1127–33.
19. Amis ES Jr, Butler PF, Applegate KE, et al. American College of Radiology white paper on radiation dose in medicine. J Am Coll Radiol 2007;4:272–84.
20. Health Physics Society. Radiation Exposure from Medical Diagnostic Imaging Procedures. McLean, VA: Health Physics Society; 2008:1–3.
21. Chen LM, Jha AK, Guterman S, Ridgway AB, Orav E, Epstein AM. Hospital cost of care, quality of care, and readmission rates: penny wise and pound foolish? Arch Intern Med 2010;170:340–6.
22. World Health Organization. International Classification of Diseases. 9th revision. Geneva: World Health Organization; 1979.
23. Kline JA, Neumann D, Haug MA, Kammer DJ, Krabill VA. Decreased facial expression variability in patients with serious cardiopulmonary disease in the emergency care setting. Emerg Med J 2015;32:3–8.
24. Fleet RP, Dupuis G, Marchand A, et al. Panic disorder in coronary artery disease patients with noncardiac chest pain. J Psychosom Res 1998;44:81–90.
25. Foldes-Busque G, Fleet R, Poitras J, Chauny J-M, Diodati JG, Marchand A. Suicidality and panic in emergency department patients with unexplained chest pain. Gen Hosp Psychiatry 2012;34: 178–84.
26. Lees-Haley PR, Dunn JT. The ability of naive subjects to report symptoms of mild brain injury, post-traumatic stress disorder, major depression, and generalized anxiety disorder. J Clin Psychol 1994; 50:252–6.
27. Bratlien U, Oie M, Haug E, et al. Self-reported symptoms and health service use in adolescence in persons who later develop psychotic disorders: a prospective case-control study. Early Intervent Psychiatry 2015;9:221–7.
28. Van Ameringen M, Mancini C, Simpson W, Patterson B. Potential use of internet-based screening for anxiety disorders: a pilot study. Depress Anxiety 2010;27:1006–10.
29. Webster R, Norman P, Goodacre S, Thompson AR, McEachan RRC. Illness representations, psychological distress and non-cardiac chest pain in patients attending an emergency department. Psychol Health 2014;29:1265–82.
30. White KS, Raffa SD, Jakle KR, et al. Morbidity of DSM-IV Axis I disorders in patients with noncardiac chest pain: psychiatric morbidity linked with increased pain and health care utilization. J Consult Clin Psychol 2008; 76:422–30.

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ARTICLE SUMMARY

1. Why is this topic important?

Despite extensive evaluation involving multiple tests, radiation exposure, and high cost an overwhelming majority of patients seen for chest pain in the emergency department do not have acute coronary syndrome, pulmonary embolism, or other cardiopulmonary emergencies. Further, it has been suggested that a significant number of these patients with noncardiac chest pain may have underlying anxiety or panic that drive their symptoms and are often undiagnosed.

2. What does this study attempt to show?

To measure the frequency of self-identified stress and anxiety among a large prospectively collected cohort of chest pain patients at 90-day follow-up, and compare their pretest probabilities, care processes, and outcomes to those who did not self-identify anxiety.

3. What are the key findings?

In our study, anxiety was an obvious problem to 8% of patients at follow-up evaluation. None of these patients had a serious diagnosis, none were diagnosed with or treated for anxiety, and one-quarter returned for medical care within 90 days. Additionally, this group of patients had similar radiation exposure and costs compared with patients without the self-report of anxiety.

4. How is patient care impacted?

These results may highlight an opportunity, often missed, to detect a treatable condition in patients who seldom receive an actionable diagnosis.